



US Army Corps  
of Engineers  
Omaha District

---

# Sedimentation In The Little Missouri River

Prepared by  
Resource Consultants & Engineers, Inc.  
3665 John F Kennedy Parkway  
Building 2, Suite 300  
Fort Collins, Colorado 80525

Prepared for  
River and Reservoir Engineering Section  
Hydrologic Engineering Branch  
Engineering Division  
Omaha, Nebraska

January 1993

## SYNOPSIS

A study has been completed to evaluate reservoir aggradation conditions for the lower 60-mile reach of the Little Missouri River and lower 4 miles of Hans Creek; all in the state of North Dakota. This study utilized available data resources to document the effect of sediment aggradation for a 33-year history of Lake Sakakawea from 1955 to 1988. Statistical data for the reservoir, evaluation of aggradation range lines, channel geometry, bed and suspended sediment data, and pool elevation records are also provided.

The extent and nature of reservoir aggradation have been determined through analysis of the 13 sediment range lines on the Little Missouri River and 3 sediment range lines on Hans Creek, and hydraulic parameter data provided for these range lines. Cross section, thalweg profile, and average bed, channel width, mean depth and area plots document the formation of a delta has been documented in the headwaters of the Little Missouri River arm between River Mile 57 and River Mile 37 that is progressing toward Lake Sakakawea at an average rate 0.3 miles per year.

Available sediment data showed that the surface sediment making up the delta consisted of medium grain sands. Sediment density data indicate an average density of the deposits to be between 28 pcf and 45 pcf.

## SECTION VII - SUMMARY

### 1. Introduction

1.1. This study was conducted for the purpose of compiling available data to describe the historic sedimentation of the Little Missouri River. The study reach for this project encompassed approximately 60 miles of the Little Missouri River beginning at the confluence with the Missouri River, and approximately 4 miles of Hans Creek, a tributary to the Little Missouri River.

1.2. The primary elements of this study include the evaluation of changes in gage height, channel geometry, and sediment size distributions throughout the study reach. The gage analysis considered a gage located approximately 29 miles upstream of the study reach boundary near Watford City, North Dakota. This was the only gage information available for the Little Missouri River near the study area. The channel geometry evaluation was based on cross sectional surveys of the 16 cross sections contained in the study reach. From these cross sections, thalweg profiles and plots of the variation in channel width, mean depth, and area with elevation were developed for each cross section. Sediment grain size and density data collected on a sporadic basis throughout the study reach were also analyzed.

### 2. Summary of Gaging Station Trend Analysis

2.1. The gaging station trend analysis included a single gage located at approximately River Mile 88.8 on the Little Missouri River. This gage has a period of record extending from 1935 to present and includes several rating curves applicable to different times during this period. Comparison of three common discharges (500 cfs, 1,000 cfs, 5,000 cfs) showed a relatively constant gage height during most of the period of record with an approximately two foot decrease in stage occurring in 1958. Available data were inadequate to explain this sudden decrease.

### 3. Summary of Range Cross Section Plots and Channel Geometry Evaluation

3.1. Another objective of this report was to perform a channel geometry evaluation based on cross sectional surveys taken between 1953 and 1988. The Little Missouri River cross section plots showed a definite trend of aggradation throughout the study reach. The channel width, mean depth and area plots provide a more detailed view of the pattern of aggradation.

3.2. This pattern of aggradation is also shown by the thalweg profile plots. These plots clearly show the formation of a Gilbert-Type delta. The data indicate that the delta is prograding towards the confluence at a rate of approximately 0.3 miles per year.

### 4. Summary of Sediment Data

4.1. Examination of the available sediment data showed the sediment making up the Little Missouri River delta consisted of sands with a median grain size between 0.2 - 0.25 mm. Sediment density data indicate an average density of the deposited sediment between 28 pcf and 45 pcf. The density measurements also indicate a general increase in density with depth at each of the locations that were sampled.



5. Summary of Future Conditions

5.1. In conclusion, the available data indicate that the delta has been prograding lakeward at a rate of approximately 0.3 miles per year. If a fairly constant sediment inflow is maintained to this reach of the Little Missouri River, a continued progradation rate of slightly less than 0.3 miles per year can be expected due to the widening of the channel near the confluence with the Little Missouri River.